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# VHF/UHF – An Expanding World

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## Weak Signal

David Smith - VK3HZ

Unless you've been in hibernation recently, you would be aware that, in late October, some of the biggest solar flares ever recorded erupted in the direction of Earth. The resulting particle storm caused havoc with HF communications, giving a number of HF DX expeditions substantial heartache. On the VHF/UHF bands, the sun noise rose to significant levels. However, one positive side to it all was that the auroral zone expanded significantly, resulting in a number of strong auroral openings on 2 m for stations in the mid to southern regions of the country. On the evening of 28<sup>th</sup> October and the mornings of the 29<sup>th</sup> and 31<sup>st</sup>, strong conditions were enjoyed by numerous VK1, VK2, VK3, VK5 and VK7 stations. A gaggle (or should that be "gargle" – if you've heard aurora, you'll know what I mean) of stations descended on 144.100 causing a huge dogpile. Unfortunately, nobody seemed to be doing much tuning around – my calls on 144.120 went mostly unanswered. Contacts were had with stations at latitudes that are normally too far north for auroral propagation. VK2DVZ in Taree was worked from Melbourne and VK3ZUX in Moe reportedly worked VK4NP in Brisbane. VK3PA in Dunolly in western Victoria also reported working several VK6 stations on CW. Interestingly, the best direction for working the northern stations from Melbourne was at a heading of about 160 degrees, not due south as expected. Also, nearly all stations exhibited a negative Doppler shift of up to 800 Hz.

The second week of November saw good propagation weather conditions descend and park across the southern part of the continent. The Hepburn web site predicted "fair to good" tropo conditions for an extended period and, once again, it was pretty close to the mark. For a number of days, the Mt Gambier and Adelaide beacons were enhanced at "fair to good" levels. A number of contacts were had from VK3 into Adelaide. Then, on 11<sup>th</sup> November, the Esperance beacon was heard in Mt Gambier at reasonable levels. Finally, on the evening of the 12<sup>th</sup> and morning of the 13<sup>th</sup>, Wally VK6WG in Albany was worked in Melbourne and further east on 2 m. On 70 cm, he also worked Roger VK5NY in Adelaide and Colin VK5DK in Mt Gambier. The Esperance 2m beacon was also heard at good strength in Melbourne. As I write, the opening is still in progress – very distracting!

The recent VHF/UHF Spring Field Day over the weekend of 1<sup>st</sup>-2<sup>nd</sup> November saw a fairly disappointing turnout of portable stations. A number of factors were against them, not the least being the arctic weather conditions over the weekend. Some of the higher sites around Victoria had received several centimetres of snow in the days preceding the event and were not the place to be. Several Hamfests had also been scheduled for the same weekend, attracting a number of people away. The only club station that I heard was the Geelong AR Club in the Barrabool Hills near Geelong. These hardy souls had every band up to 10 GHz covered. Unfortunately they could not find any takers for anything above 2.4 GHz and only one station on that band. Rex VK7MO spent a cold Saturday afternoon on the top of Mt Wellington with conditions that were the poorest he has experienced. His only "DX" contacts were with VK3AFW on 2 m SSB and 70 cm JT44 and to VK3HZ on 2 m JT44. Hopefully, conditions for the Summer Field Day will be much improved.

A new 23cm beacon has been activated in the Melbourne area. Clint VK3CSJ reports that John VK3YTV has commissioned VK3RLP running 3.75 watts on

1296.535 MHz. Antennas are two corner reflectors facing west, one facing north and one facing due east. The beacon runs FSK ident every 20 seconds. Its grid locator is QF21nu. Reception reports are requested to Phil VK3YB at PPAVEY@bigpond.com.

As part of the recent submissions to the ACA, it is good to see that a number of weak signal operators have put up submissions for a revision of the VK maximum power limits. It is puzzling that Australian amateur radio operators are limited to 400W SSB / 120W CW whereas the US operators, with similar living conditions, are allowed 1500W on all modes. It puts the VK operator at a substantial disadvantage for the likes of EME operation, where CW is the norm and giving away 11 dB of power is critical. Provided that the station complies with the recently introduced EMR regulations, then we should be able to use equipment of equal capabilities to that available to amateurs in other countries.

To finish with a report about the far upper reaches of UHF, it was interesting to hear of a recent QSO between WA1ZMS/4 and W4WWQ/4. On 11<sup>th</sup> November, they communicated over a distance of 0.521 km on 403 GHz. Weather conditions were good but still resulted in atmospheric loss of 14.4 dB per km. Further attempts will be made during the colder, dryer winter months in the hope of breaking the 1 km barrier.

## EME

Doug McArthur – VK7MO

The first weekend of the two-weekend ARRL International EME contest was held over October 18-19, 2003. If we pick a higher northern declination moon for contests then, down here, I will be working with permanent ground noise! Unfortunately it was not much of a first weekend for me as I had moon set 13 minutes after the contest started and the second active European window did not start until after the contest finished. I also had gale force winds which prevented me getting on for the first North American window and then again for only one hour during the only second European window. All up I had a less than 4 hours operating for 30 QSO's and only 17 multipliers. The good thing is that I have left plenty of stations to work during the second weekend! Only new station worked (apart from Gudmund at JW) was KJ7F.

During the only real period I had into Europe, the polarity was a little different to what I would class as normal. This is probably due to the high declination of the moon. It seemed that my signal was quite down on normal (although the echoes here seemed normal) and I ended up doing the chasing instead of being chased! A novel experience for me! I would guess that Faraday etc. left my signal into Europe at 45°. I noticed on Saturday that Gudmund was totally vertical incoming (like all Europeans except HB9Q [circ]). I thought he was circular polarised? This seemed to be the case where on Sunday his transmission was equal in both horizontal and vertical as I expected. I was transmitting horizontal for all European QSO's. The North American window was however pretty normal. A little libration on moonrise (Sunday) but all except VE6TA, were coming in vertical (USA and JA) and I was transmitting vertical as well. I don't know what Grant runs or how long he may have been calling me as I was not looking horizontal as often as I should.

What with all the wind (over 80kph) and the frustration of not being able to get on, I entertained myself by watching the various loggers. I don't know whether to be amazed or disappointed at the audacity of many "QSO's" seen taking place. One nice thing was that I did not see one on 70 or 23 cms. It will be interesting to see the eventual ARRL logs. I have cut and pasted the call signs and comments for enlightenment! Spotting however seems to have got out of hand and I was some what relieved to not find myself "spotted".

Again a lot of fun and frustration with, in the most part, great CW operating.

## Digital Modes

Rex Moncur – VK7MO

I should call this article The “JT44 ONEs and ZEDs” Mystery.

When using the WSJT program in JT44 mode, I have noticed that when sending Rogers and a report (e.g. RRRR191919), the numbers seem to decode much better than the letters. It seems that with weak signals in the range -18 to -24 dB, "1s" have a 2 to 3 dB advantage over "Zs". In direct computer to computer tests using my interface box, the issue shows up even more markedly with about a 6 dB difference. I think the reason it shows up better in an off-air test is that for real tropo signals there is quite high variability during a 30 second period which masks the effect.

Tests were run by a number of stations, many of who reported similar findings. After much detective work, I discovered that my laptop was generating tones that were slightly off frequency. The problem appears to be in the computer soundcard. Using the FSK441 “Tune” mode to obtain a steady signal, the nominally 2205Hz signal was found to be 2 Hz low. An informal poll of other stations revealed that many of them were also generating tones off frequency – up to 15Hz high. Interestingly, laptop computers seem to be the prime culprits here with 5 out of 6 showing 10Hz or worse error, while all the desktop computers were within 1Hz of the correct frequency.

JT44 can cope with frequency offsets, as it must cater for slightly different station frequencies. However, once the “sync” signal frequency has been found by the program, all other tones are expected to be quite accurately located relative to the sync tone. Unfortunately, in the case of the laptop computers, this is not the case with the higher tones being increasingly inaccurate (“Z” is the highest). The result is that the high tones fall off the edges of the digital filters, resulting in poor decoding.

Joe Taylor, W1JT – author of the WSJT program – is looking into the problem. As he said, “Apparently I underestimated just how far some computer makers will go to save a dollar or two”.

Joe also mentioned that he is working hard a new digital mode to replace JT44 that is showing performance gains of 4-6 dB. He hopes to have some code ready for on-air testing before too many more weeks.

## 2 m & 70 cm FM DX

Leigh Rainbird - VK2KRR

Well ... what can I say about 2 & 70 FM DX for the month of October? Nothing much really. It has been rather disappointing in the south of the country. No major duct openings for 2 months at the time of writing. We did however have an incidence of a rather unusual propagation mode, at this stage noted as “Non Ducting Tropo”.

But, for the operators on the northern half of the Queensland coast its been quite a different story with some red hot ducting conditions as far as Papua New Guinea and New Caledonia.

If you weren't on air earlier in October you missed out on contacting Felix VK4FUQ who was portable for a few days at Hallorans Hill on the Atherton Tablelands. Felix was running 2m only with a 3 element yagi and about 45 Watts output. Felix had some good contacts both simplex and via repeaters. Some of the simplex contacts

were VK4HSV in Townsville and VK4FNQ near Charters Towers, both around 300 Km. Felix also made it to the Townsville repeater and to Mackay, 600Km.

Midway through the month and mentioned earlier was "Non Ducting Tropo" or NDT. What is this I hear you say? Put simply, it's an enhanced signal condition when there is actually no ducting. It provides better 70 cm conditions rather than 2 m.

I had noted this only once before where 70 cm was better than 2 m but took no notice. What really brought this out in the open, was extra reports from other operators on the FM DX Group E-mail list.

Initially I think Chris VK3VSW in Geelong was the first to report: "Just worked VK7LCW - Peter on both 2 & 70 cm this evening at around 10:15 UTC. Signals on 70 cm were very very good, 5 X 9+ 20dB, 2 Meters were 5 X 3 ... interesting ..."

Then Brian VK5ZMB in Gawler: "There has been good 70 cm ducting tonight between my QTH (Gawler 40 Km north of Adelaide) and Pt Lincoln, approx. 250 Km's. The Pt Lincoln 70 cm repeater has been a steady S7 to 8 all evening and I managed to work VK5RF via the repeater. Strangely though I could not hear the Pt Lincoln 2m repeater which I regularly can hear and was S9 most of yesterday."

Bill VK5ACY on Kangaroo Island did not send an email, but reported on the VK/ZL Logger about good 70 cm conditions to Mt Gambier beacon, but not as good on 2m.

At The Rock, I noted extended range with reasonable signals during the day, but with very bad fading or QSB. At times I would describe it as 'violent' crashes of the signal into the noise then back up to something like S9 in some cases. At times this could occur at every 10 seconds or so. I also noted an extremely low background noise level, much lower than normal, which gradually rose again later in the afternoon.

I did not note the exact timing, but some time around 10 pm I noted signals from 2m repeaters were quite good, and were extremely stable, no QSB at all. Bendigo, 314 Km away was constant S9, Macedon 324 km was S7-8. Someone triggered the Macedon 70 cm repeater, which caused me to check 70 cm. I noted Bendigo 70 cm at S9+40dB, though I did not turn the antennas directly on to Macedon 70 cm, it was something like S9+10dB. I could also get the Grampians 70 cm at 471 Km at about an S7 nothing from there on 2m.

Some points on NDT -

1. Is commonest during high pressure conditions. NDT is often best when the high pressure is in decline and moving east.
2. Occurs at VHF, UHF and higher frequencies, longer wavelengths do not usually enjoy as good NDT as shorter ones.
3. Best conditions usually occur early morning or late evening.
4. Fading (QSB) is a problem. May be slow and very deep. May include faster 'flutter' fading.

From the above points, I have underlined some parts which I thought were of particular relevance to what was observed.

From point number 1, we were in the tail end of the current high pressure system moving east.

Point number 2, 70 cm was much better than 2 m.

Point 3, late evenings was generally noted.

Point 4, although none of the other stations that submitted reports mentioned QSB, I did note very bad QSB here during the day.

Ducting graphs from around the time of the various reports show no ducting at all. Also at the time there were high winds and rainfall occurring in the area. Very interesting.

In the latter part of the month, things really got moving in the far North Queensland coastal areas. The Hepburn Charts gave indication that some good ducting may be available, and indeed it was. Many stations passed signals back and forth making very good contacts.

Creating a good deal of attention has been the presence of Jim P29JB's signal along the VK4 coast. Jim is transmitting from Papua New Guinea and is running a 4 element quad antenna and anywhere between 15 to 90 Watts. Jim has been noted making contacts into the following 2 m repeaters – Townsville 1088 Km, Mackay 1315 Km, Gladstone 1655 Km and Gympie 1958 Km.

Mike VK4MIK in the Atherton Tablelands has been having a big go and making the most of the conditions. Mike's most distant repeaters worked have been Hodgson Range near Clermont, 640 Km, then into Mackay at 560 Km. To Mike's surprise he has also been able to get into the Hayman Island repeater a number of times which is 450 km.

Felix VK4FUQ at Ingham has on occasion been able to work into the Mackay and Mt Seaview repeaters, distances being around 415 Km.

Late reports from Gary VK4ABW near Townsville indicate the path from VK4 to New Caledonia was present at times. Gary worked FK8HA and FK8GX through the Noumea repeater on 146.800 and was then able to work them simplex. Well done Gary, approximate distance is 2074 Km! I believe Gary has also been working simplex to Jim P29JB in Papua New Guinea with an approximate distance of 1100 Km.